

**ABSTRACT OF THE DISCLOSURE**

An extremely high efficiency, cross flow, fluid-fluid, micro heat exchanger and novel method of fabrication using electrode-less deposition is disclosed. To concurrently achieve the goals of high mass flow rate, low pressure drop, and high heat transfer rates, the heat exchanger comprises numerous parallel, but relatively short microchannels. Typical channel heights are from a few hundred micrometers to about 2000 micrometers, and typical channel widths are from around 50 micrometers to a few hundred micrometers. The micro heat exchangers offer substantial advantages over conventional, larger heat exchangers in performance, weight, size, and cost. The heat exchangers are especially useful for enhancing gas-side heat exchange. The use of microchannels in a cross-flow micro-heat exchanger decreases the thermal diffusion lengths substantially, allowing substantially greater heat transfer per unit volume or per unit mass than has been achieved with prior heat exchangers.